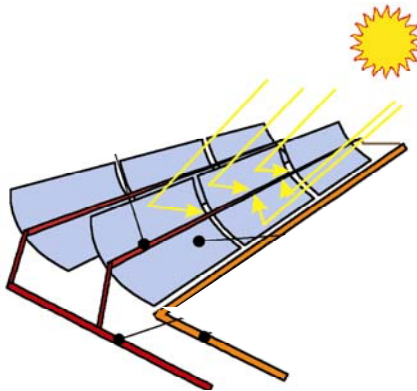


The Value of Thermal Storage



**Workshop on Thermal Storage for Trough
Power Systems**

February 20-21, 2003 Golden CO

**Brandon Owens, Platts Research & Consulting
Renewable Energy Analysis Director**

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Storage Value Proposition

Profit Maximization

Energy storage allows the plant operator to maximize profits. During periods of low hourly power prices, the operator can forgo generation and dump heat into storage; and at times of high prices, the plant can run at full capacity even without sun.

Peak Shaving

Solar generating capacity with heat storage can make other capacity in the market unnecessary. With heat storage the solar plant is able to “shave “ the peak load.

Storage Value Proposition

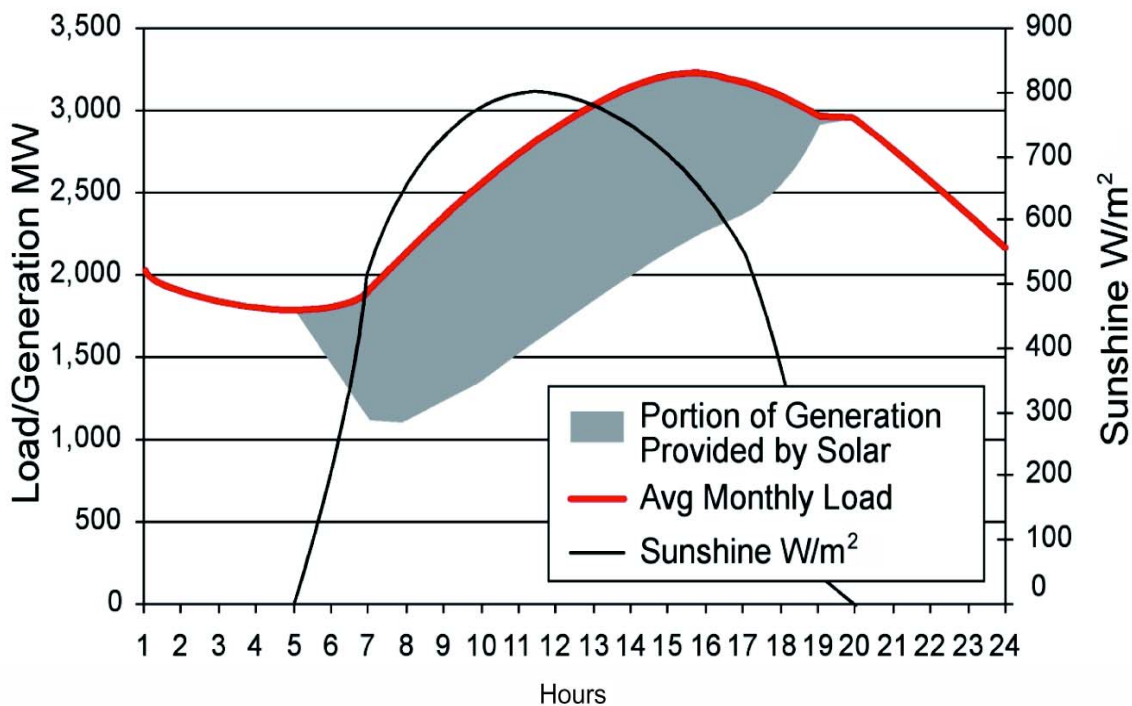
Reducing Intermittence

The ability of thermal solar plants to use heat energy storage to keep electric output constant: (1) reduces the cost associated with uncertainty surrounding power production; and (2) relieves concerns regarding electrical interconnection fees, regulation service charges, and transmission tariffs.

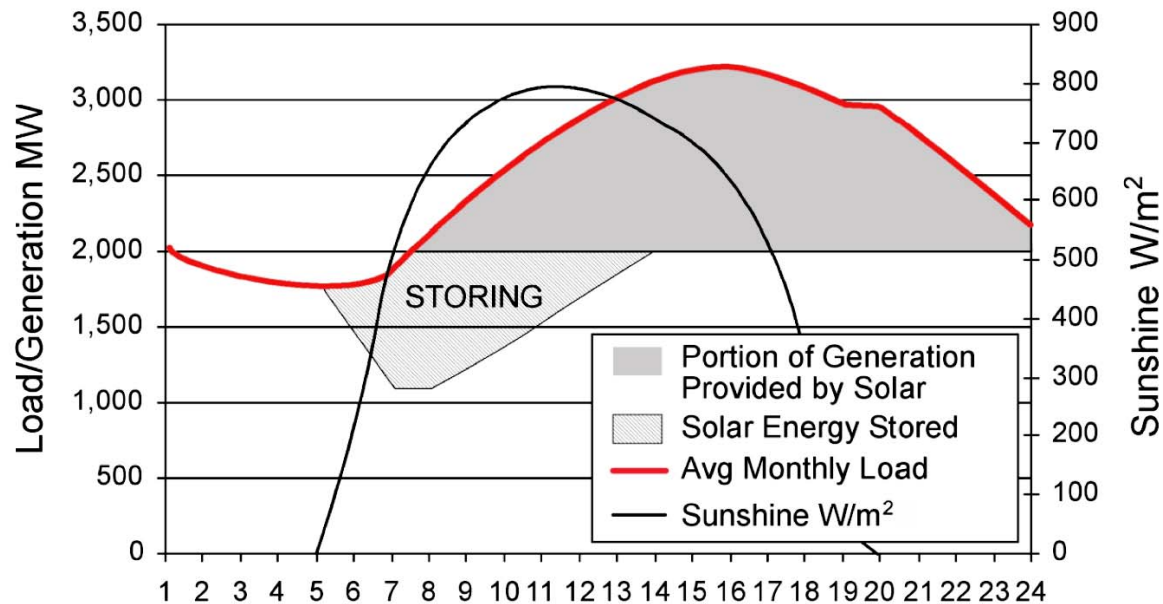
Increasing Plant Utilization

Solar plants equipped with heat storage have the ability to increase overall annual generation levels by “spreading out” solar radiation to better match plant capacity.

Sunshine and the Demand for Power Trough without Storage



Sunshine and the Demand for Power Trough with Storage

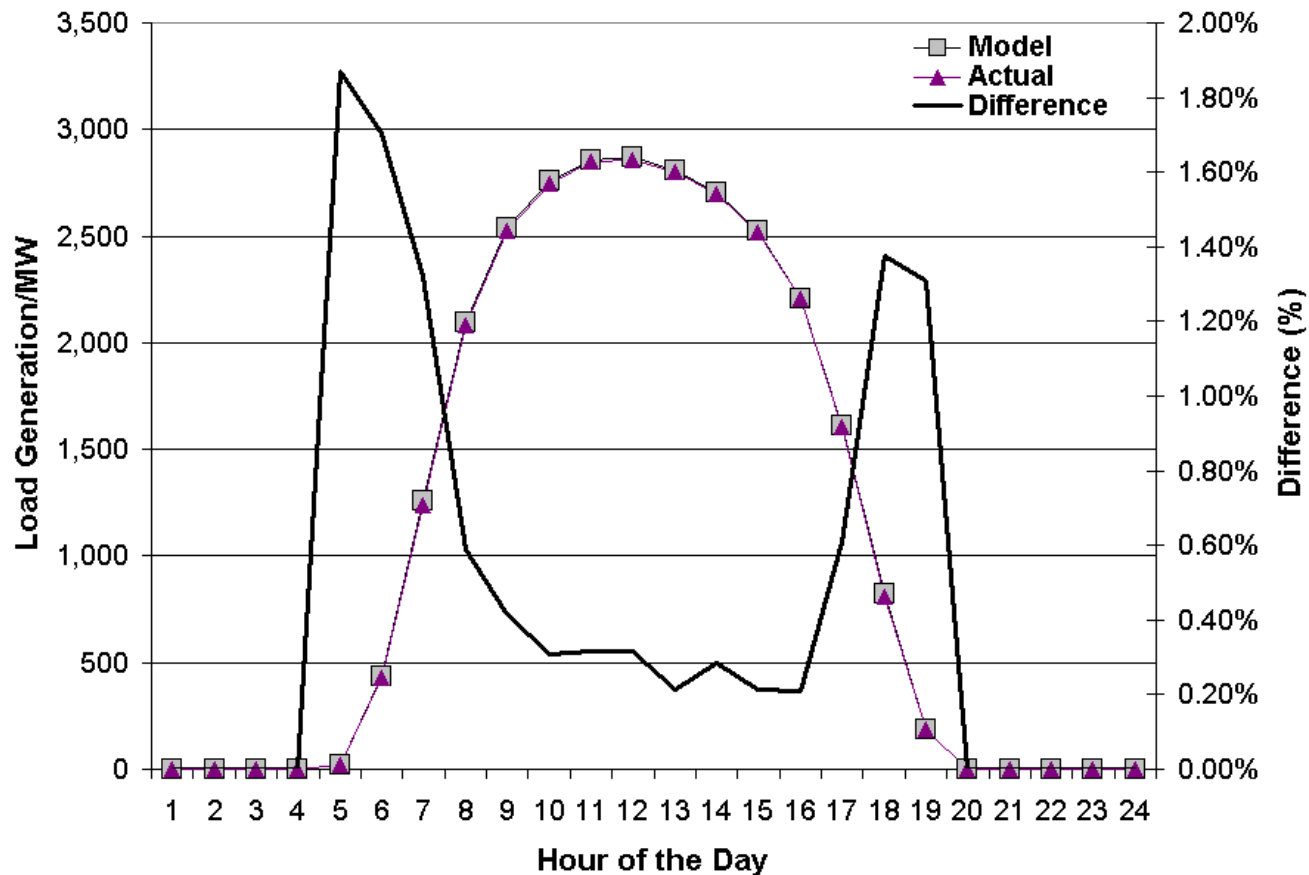


5-Step Storage Valuation Approach

- 1. Solar Simulation (Platts)**
- 2. Power Price Simulation (Platts)**
- 3. Solar Plant Generation Modeling (NREL-Price)**
- 4. Revenue Estimation (Platts/NREL)**
- 5. Storage Value Calculation (Platts/NREL)**
- 6. Results Summary (Platts/NREL)**

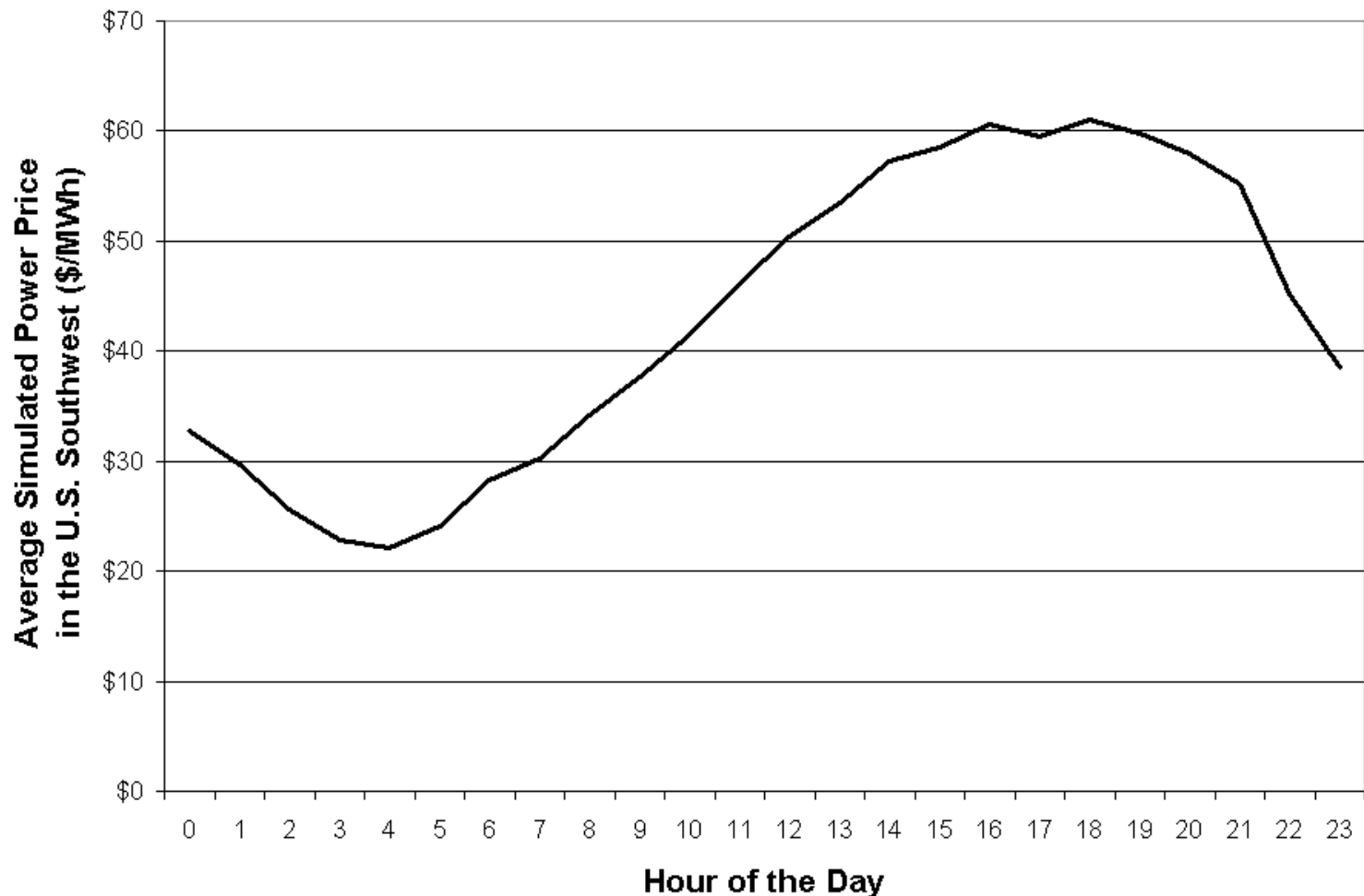
1. Solar Simulation

100 Years of Sun



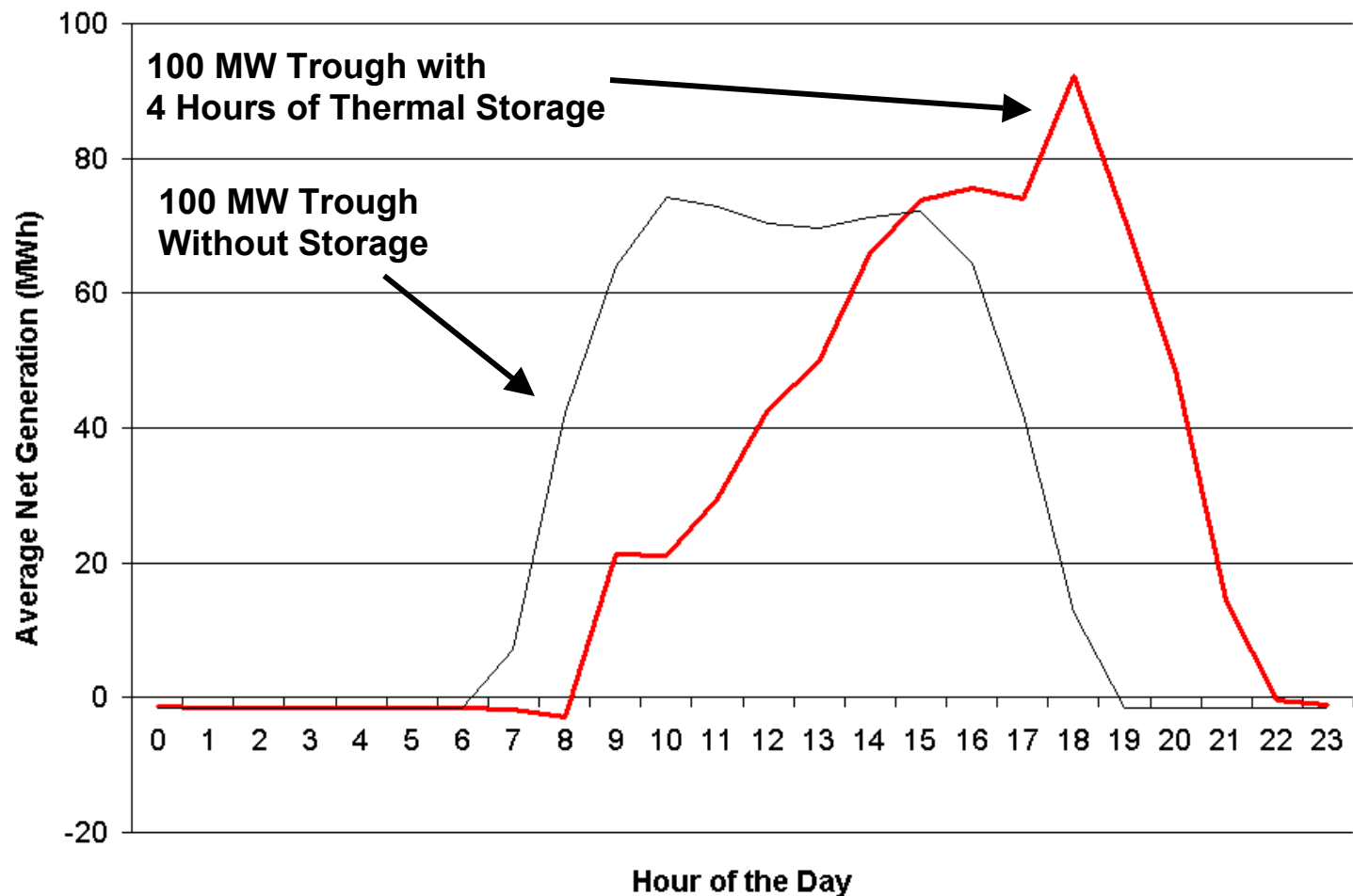
2. Power Prices

Power Prices in the U.S. Southwest



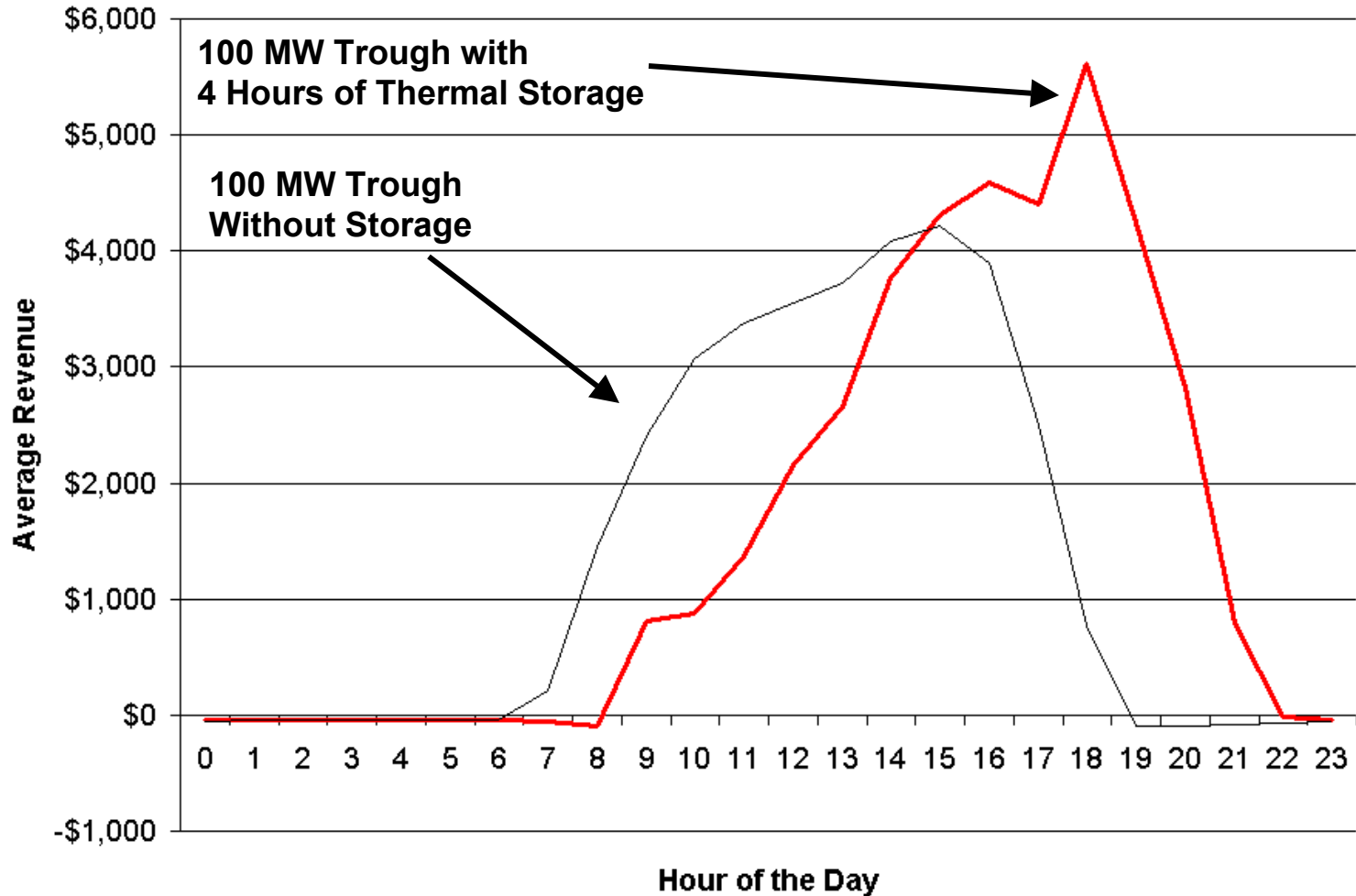
3. Solar Plant Generation Modeling

100 MW Trough with/without Storage



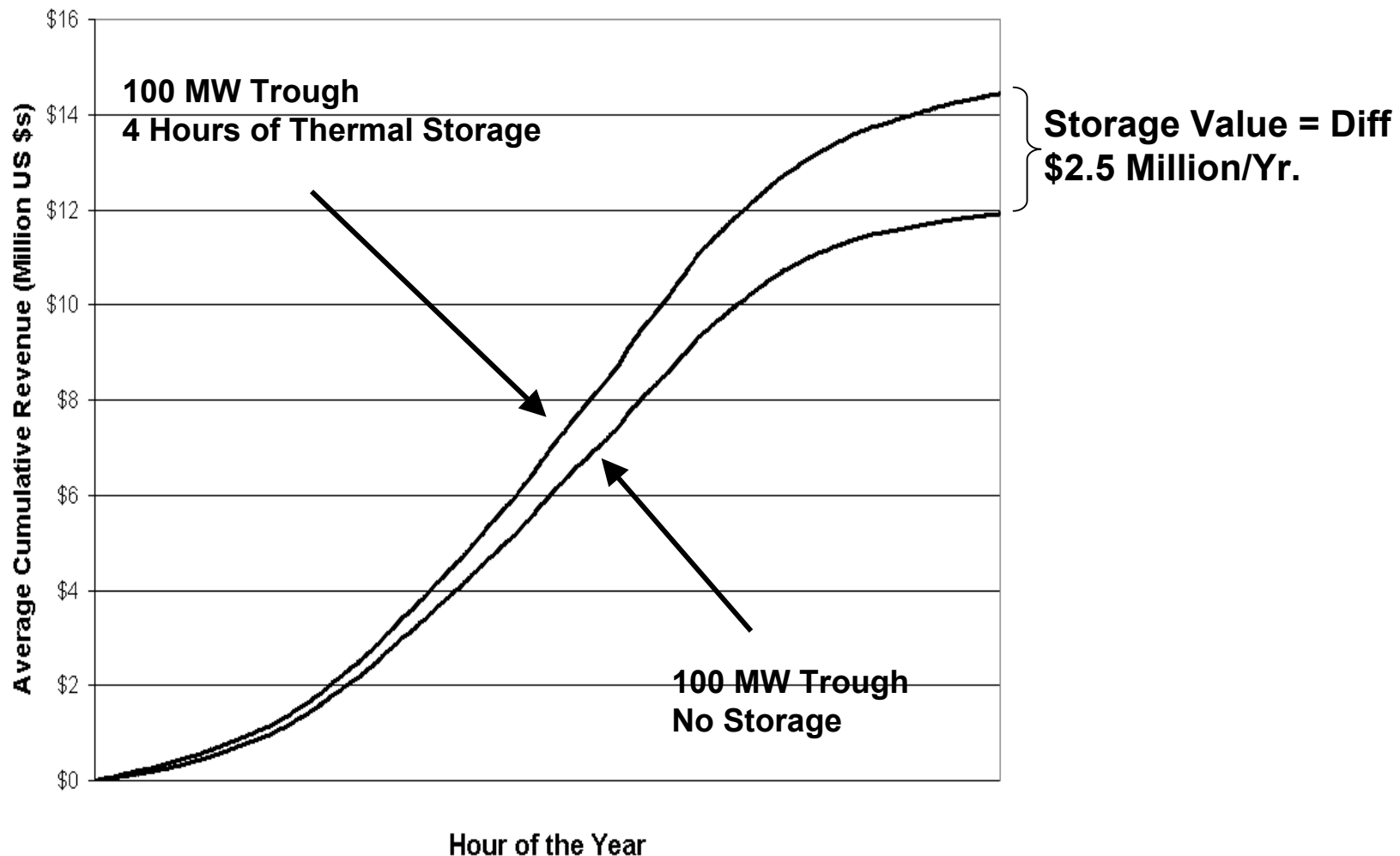
4. Revenue Estimation

Plant Output Times Hourly Power Prices



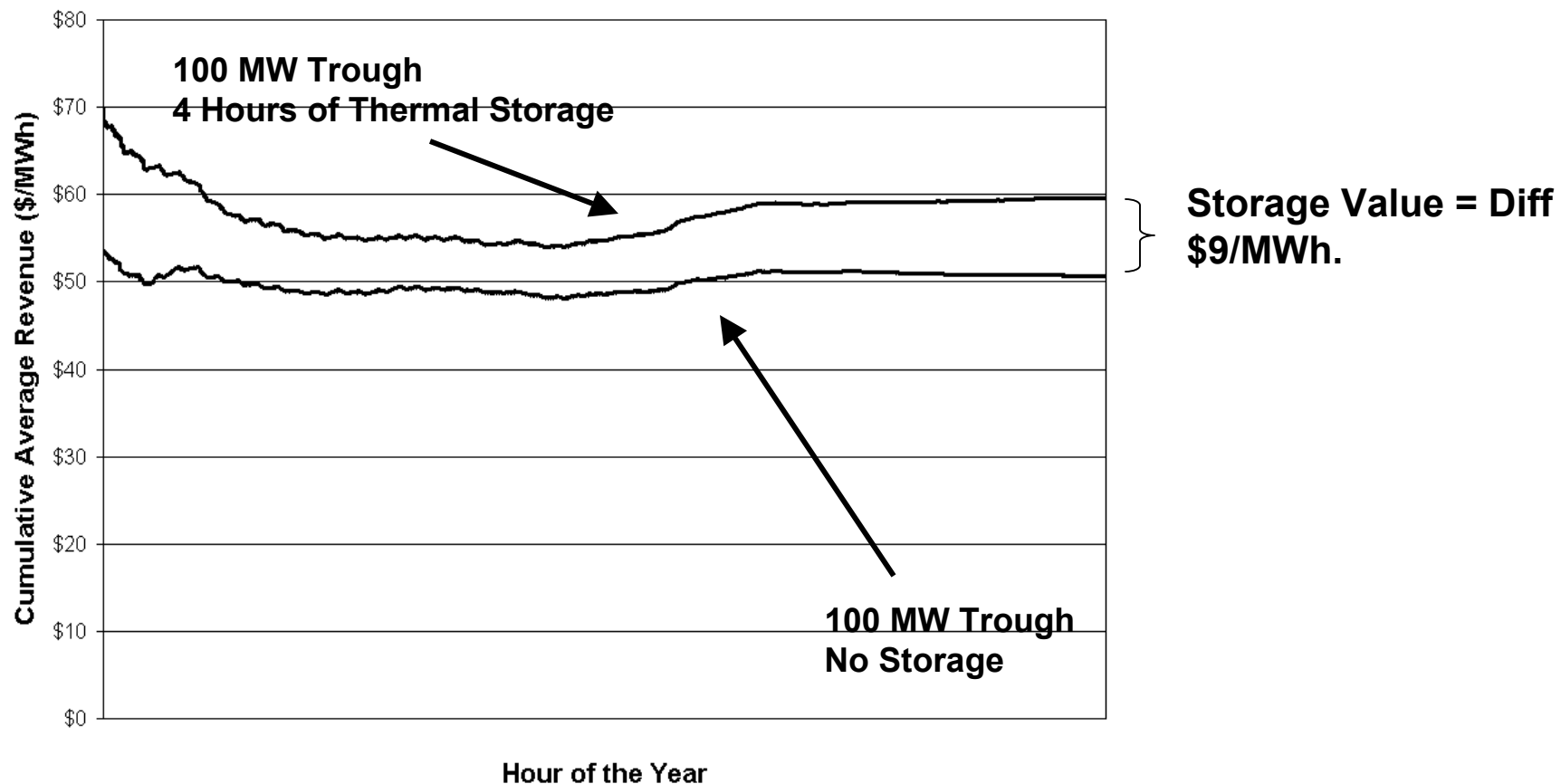
5. Storage Value Calculation

Annual Cumulative Plant Revenue



5. Results Summary

Storage Value per MWh



Important Considerations

- ➡ Storage valuation is site-specific.
- ➡ Ultimately, simulation and scenario analysis are required to arrive at a defensible figure of merit for an individual plant.
- ➡ In the end, storage benefits must be weighted against storage costs to determine the appropriate storage strategy.
- ➡ Often plant-level storage options must be considered with the context of an entire portfolio of generation assets.

Questions/Contact Information

May I respond to your questions?

Please Feel Free To Contact Me:

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